CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
S1409

Project Title
Cruise Control

Abstract

Objectives/Goals
My objective was to make a robot drive autonomously at a constant velocity, regardless of incline. To achieve this, I compared two different approaches to velocity control: a fixed-step form and an implementation of a Proportional-Integral-Derivative (PID) algorithm. I predicted that PID would reach the desired speed faster than the fixed-step approach, without sacrificing other crucial aspects of control.

Methods/Materials
First, I wrote Java programs to implement both approaches and measure selected quality metrics. I then tuned each of the methods by adjusting algorithmic parameters in order to strike a balance between responsiveness and accuracy. I tested the programs by placing the robot at the bottom of a steep, uneven slope and measuring its velocity and the quality metrics while driving up the slope under the control of each of the two algorithms.

Conclusions/Discussion
I concluded that PID was the superior algorithm, due to its shorter response time and greater overall accuracy. However, the fixed-step approach turned out to be more accurate than I originally hypothesized, exhibiting fewer oscillations and more consistent oscillation amplitude than the PID program.

Summary Statement
I compared control algorithms for maintaining the constant velocity of a robot on a slope.

Help Received
FIRST Robotics Team 100 built robot.